in which two branches have developed from the region of the "glands." In the ovary itself, three branches have developed, one from the "axil" of each valve, the third median to these two. Figures eight, nine, and ten are illustrations of flowers that are essentially similar to the previous one; in figure nine the branches from the "glands" are more fully developed. Stamens and ovaries have developed in the axils of a few of the bracts on these branches. The flower of figure ten is so modified that one can but compare, by virtue of their position, the subtending basal bracts of the upper branches to the valves of a silicle. Figures eleven and twelve represent a couple of flowers that have produced central branches in the position normal for the fruit. Sepals, petals, and stamens are not greatly altered in appearance.

Although it is realized that general deductions concerning morphological structures cannot safely be drawn from teratological material, these points are of interest at least: 1. Floral branches from below the ovary apparently have arisen in each case from the position considered "normal" for the glands of the flower. 2. In most cases a branch has developed from the "axil" of each valve of the silicle. 3. Judged from the number of branches that develop in the ovary, there is no indication that there are four carpels in the flower.

University of Washington, Seattle.

REVIEW

Foundations of Plant Geography. By Stanley A. Cain. Pp. xiv + 556 and 63 figures. Harper & Brothers, 1944. $5.00.

This is undoubtedly the most comprehensive and modern book on plant geography written from the historical point of view. Its comprehensiveness is indicated both by its length and the number of titles, 720, in the section on "Literature Cited." Its modernity is evident from the fact that nearly two-thirds of these titles represent works written since 1930. For these reasons alone it is a "must have" for the library of every serious botanist or botanical institution. No where else can one find such a wealth of recent material on this subject carefully and impartially reviewed.

To readers of Madroño Dr. Cain's book is of particular significance for two reasons. In the first place, its basic framework is taken from the principles published by our editor, Dr. Mason, in this journal (vol. 3, pp. 181–190). Secondly, both the history of the flora of the western United States and the work of western botanists receive particular emphasis. The figures include no less than eight outline maps of California and the adjacent states, which illustrate the distribution of such familiar and interesting groups as *Sequoia, Libocedrus, Pinus Jeffreyi, Pentstemon* spp., and *Crepis.* An outline map of the Monterey Peninsula, illustrating

the distribution of its interesting conifers, is the only map of a local area which is included.

Although clearly written and well organized, Dr. Cain's book will undoubtedly be of more value to advanced students and mature botanists than to beginners or amateurs. It is a reference book rather than a textbook or popular work. As such, its value is enhanced both by its comprehensiveness and the balanced impartial viewpoint of its author. All material pertinent to the subject, whether obtained from paleontology, population studies, cytogenetics or the more classical approach of the mapping of modern species distributions, is given ample consideration. Such controversial viewpoints as those held by Clements, Willis, and Wegener are treated as objectively as possible, with due consideration given to the arguments on both sides. The author, however, is clearly more interested in patterns of distribution of species and genera in relation to evolution than in plant associations and climate; in other words, the book treats with historical rather than ecological plant geography. The five principal divisions of the book are, in fact, I, Introduction (28 pp.); II, Paleoecology (118 pp.); III, Areography (173 pp.), including such topics as Dispersal and Migration, Center of Area, Center of Origin, and Endemism; IV, Evolution and Plant Geography (77 pp.); and V, Significance of Polyploidy in Plant Geography (30 pp.).

In such an extensive work some minor errors are inevitable. For instance, in the phylogenetic tree of the California closed cone pines on page 113, *Pinus attenuata* is interpreted as a Pleistocene derivative of *P. linguiformis,* whereas on page 83 a reproduction of Axelrod's list of species from the older Mount Eden Pliocene beds includes a counterpart of *P. attenuata,* listed under the synonym, *P. tuberculata.* Also, on page 217 a table showing the endemism in the Galapagos Islands includes figures on the "Maximum Altitude in M.," which range from 210 up to 5000, and agree with published maps only when read as feet, not meters. The discussion of the cytogenetic evidence is accurate and well balanced, although somewhat redundant, as evidenced by the quotation of a paragraph from one of this reviewer's papers, which he does not consider of particular significance, in two different places (pp. 239 and 469). The format, typography, and illustrations are in general clear and attractive, although the number of typographical errors is not inconsiderable.

Dr. Cain has done a great service to all students of plant geography and evolution. His work will continue to be of primary significance for many years to come.—G. Ledyard Stebbins, Jr., Division of Genetics, University of California, Berkeley.